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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

March 8, 1995

Mr. William Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W., Room 222  
Washington, DC 20554

DOCKET FILE COPY ORIGINAL

Reference: ET Docket No. 92-235

Dear Mr. Caton:

Pursuant to §1.1206 of the Commission's rules and regulations, Motorola hereby reports that an ex parte discussion was held on March 8, 1995 by representatives of Motorola with Herb Zieler and Gene Thompsen of the Wireless Telecommunications Bureau, to discuss comments on the 12.5 kHz and 25kHz masks proposed by Ericsson on February 8, 1995.

Attached is written material used in the discussion.

Regards,

*Nick Gorham*

Nick Gorham, P.E.  
Manager, Spectrum & Standards

Attachment

cc: Commission Participants

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March 8, 1995

Re: Comments on the 12.5 kHz and 25 kHz masks proposed by Ericsson on Feb. 8, 1995.

Because two masks were proposed by Ericsson, each will be reviewed separately.

Prior to the review it is important to note that spectrum analyzer settings for performing the mask measurements are critical for any digital modulation with a modulation rate in excess of the resolution bandwidth, as stated in Appendix B of the TIA comments to the FCC on PR Docket 92-235 dated May 28, 1993. and in clause 2.2.11.2b of its standard TIA/EIA-603 for analog FM voice.

The use of a 300Hz resolution bandwidth has been the precedent for part 90 type acceptance filings for both 25kHz and 12.5kHz channelization analog voice (F3E emission) and 25kHz channelization digital voice and data (F1E and F1D emissions) modulation. This choice was made because 300Hz resolution bandwidth yields a measurement result for high speed digital modulation comparable to that obtained with an FM tone, and was the basis for masks such as that in 47 CFR part 90.209(g) and those in the docket 92-235 proposed part 88.421(e). For this reason, Motorola suggests that mask measurements for 12.5kHz modulation be made in accordance with the TIA comments in Appendix B of their comments to the FCC dated May 28, 1993 which specifies the use of a 300Hz resolution bandwidth, a video detector bandwidth of at least 3 kHz, and peak hold detection.

In addition Motorola suggests an adjacent channel protection ratio be adopted as applicable per TIA/EIA-603 clause 3.2.14 and TSB102.CAAB clause 3.2.8 in conjunction with a specific mask to ensure the mask is performing its intended adjacent channel interference protection purpose.

It is noted that 100Hz is specified in 47 CFR 90.209(l)(4) which is currently specified only for the 5kHz spaced 220-222MHz band and is limited to very narrow bandwidth single sideband emission; and, it also was proposed by the FCC for all bands below 1000MHz in clause 88.421(h) in FCC Docket 92-235 which proposed 5.0kHz and 6.25kHz spacing. The narrower resolution bandwidth of 100Hz will produce measurement results on high rate digitally modulated radios that are 4.77dB less than the measurement results produced using the wider 300Hz resolution bandwidth recommended by TIA because the digitally modulated radio will produce a noise-like spectrum rather than a discrete sideband spectrum. This measurement difference is critical to interference control and must be reflected in the design of the mask as for a given mask, using the 100Hz resolution bandwidth may pass a digital transmitter that fails to pass using the more conservative 300Hz resolution bandwidth.

### **Comments on the Ericsson 12.5kHz Mask**

Ericsson has previously proposed 5 different masks during several meetings of the TR8.6 Equipment Performance Recommendations sub-committee of TIA. Each of those masks was different from this mask. None was found acceptable by the sub-committee. Some masks proposed the use of 100Hz analyzer resolution bandwidth, and some proposed the use of 300Hz. No specific statement is apparent in this Ericsson document that clarifies what resolution bandwidth is to be employed for emission measurements to their recommended mask, or what adjacent channel protection ratio is attained, or what channel bandwidth is necessary.

The mask selected by the TR 8.6 sub-committee of TIA for 12.5kHz channelization is that listed in TIA document TSB102.CAAB clause 3.2.5, uses 300Hz resolution bandwidth and peak detection for measurement, and provides attenuation at the rate of 7dB/kHz in the region from 2.5 -12.5kHz frequency displacement. This results in a mask with an attenuation of 70dB at the center of the adjacent channel or 26.3 dB at the channel edge. The choice of this mask resulted from the request by the F.C.C. to provide an improved mask over the one currently specified in Part 90 for 12 1/2 kHz at 900 MHz.

The mask proposed by Ericsson does not attain the 70dB level until 15kHz displacement, much like the mask in docket 92-235 proposed part 88.421(g) which is used to characterize 896-901MHz/935-940MHz equipment operating with an authorized bandwidth in excess of the 12.5kHz channel spacing. The comparatively broad part 88.421(g) mask was feasible when the highly structured new 900Mhz band was initiated because of the use of interference control mechanisms like power and deviation cutback, dynamically controlled splatter filter cutoff frequency and contiguous channel assignments being the norm. These will not be the norm in the less structured lower bands migrating to 12.5kHz channelization.

The relaxed rolloff rate of 5.3dB/kHz of the Ericsson proposed mask will result in an attenuation of only 56.7dB at the center of the adjacent channel or 23.6 dB at the channel edge. This represents a degradation of more than 13dB at the adjacent channel from the TIA recommended TSB102.CAAB mask and a correspondingly higher level of interference to an adjacent channel user. If Ericsson used 100 Hz resolution for their measurements instead of 300 Hz the comparison to T.I.A. would have to be adjusted by 4.77 dB to 51.9 dB and 18.8 dB.

No objection is taken to Ericsson's concept of a "top hat" profile in the center of the TSB102.CAAB mask formed by a flat top with a sharp step to an attenuation in the 23 to 29dB range, a practice Canada has adopted as evident in Figure 3 of Supplement 1993-1 to Canadian Radio Standards Specifications (RSS's). This could be readily implemented by "grafting" it to the TIA recommended TSB102.CAAB mask, but the choice of step amplitude and frequency is critical to the mask's occupied bandwidth

A specific intention of the single TIA proposed mask was to apply it to both analog FM (F3E emission) and digital modulation (F1E, FID et. al emission designators) as they

will co-exist in the bands below 512MHz. Another intention was to use an audio filter with a 2700Hz cutoff frequency characteristic where the transmission becomes de-emphasized, as commonly used for 896-901MHz/935-940MHz equipment and specified in TIA/EIA-603 clause 3.2.6.2b. Using 2500Hz maximum deviation and 2700Hz as the audio corner frequency, the formulation for calculating the necessary bandwidth for F3E emission in table III-A of 47 CFR part 2.202(g) becomes  $2 \times (2500 + 2700) = 10.4$  kHz. The 99% power bandwidth for APCO Project 25 type C4FM modulation has been measured to be about 2.0kHz. less necessitating the use of the analog FM occupied bandwidth as the maximum.

Motorola suggests that the "top hat" attenuation step amplitude and displacement frequency be carefully considered by the many manufacturers participating in the TIA TR8 Private Radio committee, and other interested and affected parties that are involved with radio standards in the TIA TR 8.6 sub-committee and were involved with the adoption of the recommended TSB102.CAAB mask.

#### **Comments on the 25kHz Channelization Mask**

No comments on the mask for 25kHz channelization were submitted by either TIA or Motorola during the comment period on narrowband docket 92-235.

Any changes to this mask could impact users in all land mobile bands as well as manufacturers. Consequently, we suggest this input be referred to T.I.A. where it can be handled via established procedures and not be considered within the current narrow band Docket 92-235 proceedings.